

## Announcements

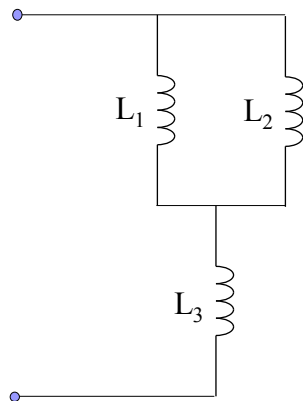
- Midterm Review session this Thursday in Cory 277 from 5pm-8pm
- Midterm #1 Next Tuesday in Dwinelle 145 from 12pm-1:30pm
  - ☐ You are allowed on 8½ x 11 cheat sheet (front and back) but must be hand written
  - ☐ You are not permitted the use of a graphing calculator
  - ☐ Past Midterms posted online
- 1<sup>st</sup> lab slot is cancelled next week. Only attend your second lab slot. For those of you that have your second lab slot on Tuesday, the prelab is due at the end of the lab.
- HW #3 online

## Lecture #8

### OUTLINE

- Review and examples
  - ☐ 1<sup>st</sup> and 2<sup>nd</sup> Order Circuits
  - ☐ Phasors
  - ☐ Complex impedance
  - ☐ Misc. Problems

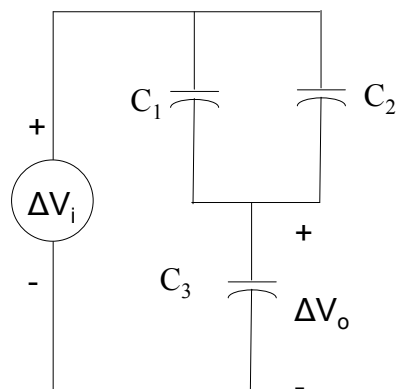
## Equivalent inductance



$$L_{eq} = ?$$

$$Z_{eq} = ?$$

## Equivalent Capacitance and Voltage Division

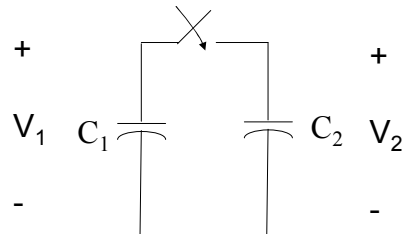


$$C_{eq} = ?$$

$$Z_{eq} = ?$$

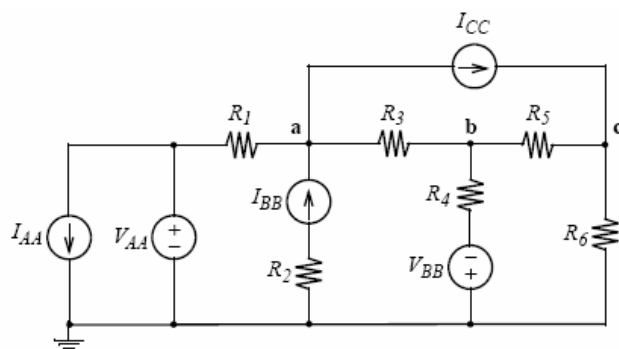
$$\Delta V_o = ?$$

## Charge Sharing



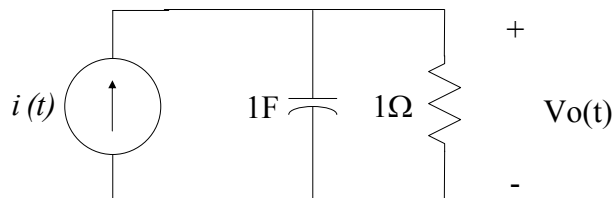
$$V_{\text{final}} = ?$$

## KCL/KVL



- Solve for all the electrical characteristics.

## 1<sup>st</sup> Order Circuit Example 1



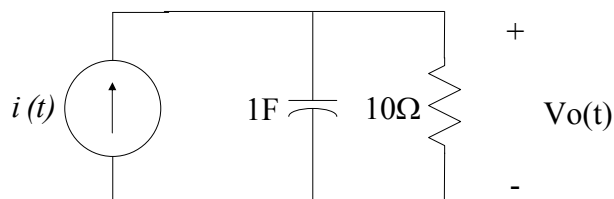
- Find  $V_o(t)$  knowing  $i(t) = 2+3u(t)$ , the unity step function using a **source transformation**.
- Plot the  $V_o(t)$ ,  $i(t)$ ,  $E_{\text{capacitor}}(t)$ .
- How long does it take  $V_o(t)$  to reach 4V?

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Instructor: Octavian Florescu

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## 1<sup>st</sup> Order Circuit Example 2



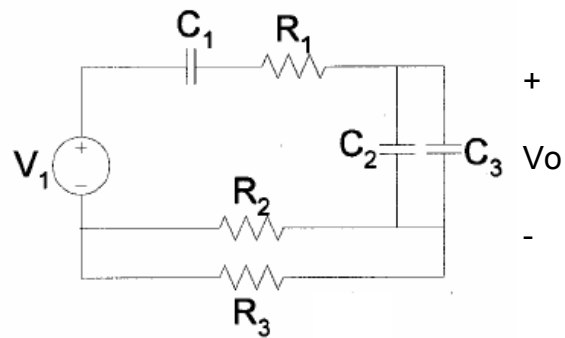
- Find  $V_o(t)$  knowing  $i(t) = 0.2+0.3u(t)$
- Plot the  $V_o(t)$ ,  $i(t)$ ,  $E_{\text{capacitor}}(t)$
- How long does it take  $V_o(t)$  to reach 4V?

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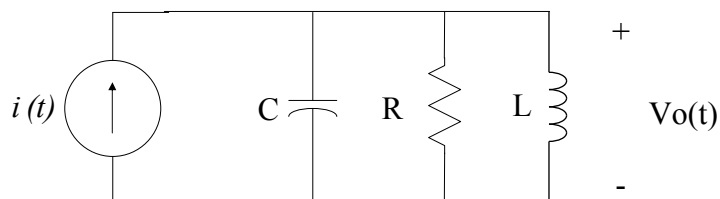
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## One Last 1<sup>st</sup> Order



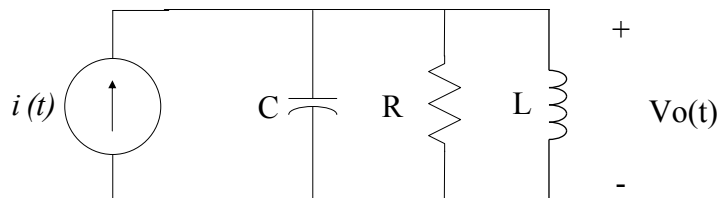
- Find  $V_o(t)$  if  $V_1 = u(t)$

## 2<sup>nd</sup> Order Circuit Example 1



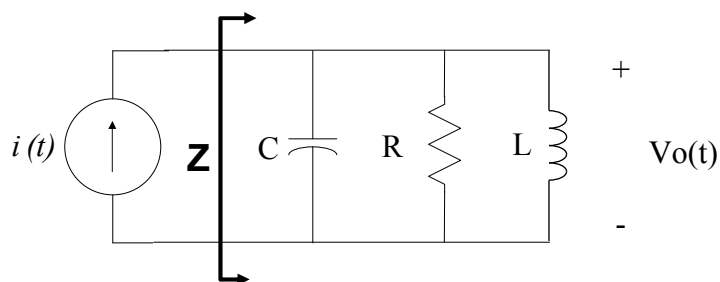
- Find the damping factor and the natural frequency of this circuit.

## 2<sup>nd</sup> Order Circuit Example 2



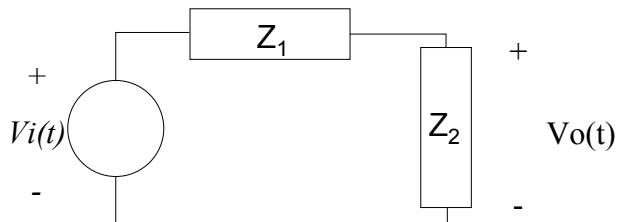
- $i(t) = 1 + u(t) + A \cos(\omega_0 t + \Phi)$
- Find  $V_o(t)$  knowing  $L = 10 \mu\text{H}$ ,  $C = 1 \text{ nF}$ ,  $R = 50 \Omega$

## Phasor Example



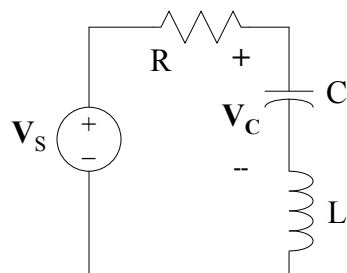
- Find the total equivalent impedance  $\mathbf{Z}$  of the circuit.
- At what frequency is the impedance purely real?

## Complex Impedance Example 1



- Find  $V_o(j\omega)/V_i(j\omega)$
- Knowing  $Z_2$ , choose  $Z_1$  such that maximum power is delivered to the load.

## 2<sup>nd</sup> Order Circuits



- Find the Bode Plot for  $V_c/V_s$